The production of a cheap gaseous form of fuel is a great gain; so also is the invention of a means whereby the large stores of anthracite coal in this and other countries can be utilised.

Of all the forms of carbon experimented with in the production of the new gas, anthracite was found the best. Anthracite is difficult to burn; the ordinary forms of furnace do not admit of such a complete oxidation as is required in order to maintain the combustion of anthracite. But the blast of air carried into the gas generator of the water-gas apparatus by the steam jet insures the presence of a large quantity of oxygen, and therefore the combustion of the anthracite. Whether a simpler means could not be adopted for the combustion of anthracite is a question worthy of consideration. That a steam jet can be thrown into an ordinary furnace charged with anthracite, and the combustion of the coal be thereby insured, has been shown to be possible. Nevertheless, the production of combustible gas from the anthracite is to be preferred, for many reasons, to the consumption of the solid fuel.

The fact that we shall soon probably be in a position to make use of our stores of anthracite, is one of very considerable importance from an economic point of view. In possessing large quantities of anthracite we possess a a valuable commodity, but if we cannot realise a use for that commodity it ceases to be a source of wealth to us.

Further, large quantities of anthracite are known to exist in some of the British Colonies and in the United States; the utilisation of these would mean an increase in the commercial enterprises owned by Englishmen abroad, or supported by English capital; it would also probably imply an increase in the tonnage of shipping, and would thus tend to increase our "international wealth."

Whether it be regarded from the point of view of the chemist, or of the economist, the introduction of a cheap gaseous fuel manufactured from anthracite, marks a point of no little importance in the advance of manufacturing industries.

The experiments detailed in the paper by Mr. Davies show that the new gas is especially adapted for use in cooking operations in large private establishments, in clubs, hotels, barracks, &c. It is known that cooking can be more cheaply and more rationally conducted with the aid of gaseous than of solid fuel; if the new fuel does all that it promises to do, judging from the actual trials already made, its introduction will be welcomed by the artistic cook no less than by the scientific chemist, and by the political economist. M. M. PATTISON MUIR

## *FOSSIL FLORA OF GREAT BRITAIN*

*The Fossil Flora of Great Britain; or, Figures and Descriptions of the Vegetable Remains Found in this Country.*

*Illustrations of Fossil Plants, being an Autotype Reproduction of Selected Drawings prepared under the Supervision of the late Dr. Lindley and the late Mr. William Hutton, between the Years* 1835 *and* 1840—*and now for the first time published by the North of England Institute of Mining and Mechanical Engineers.* Edited by G. A. Lebour, F.G.S. (Newcastle-upon-Tyne, 1877.)

THE publication, in 1831, of the first number of the "Fossil Flora of Great Britain," by Dr. Lindley and William Hutton, marked the beginning of a new era in the history of English Palæo-phytology. Much had been previously done on the Continent. The magnificent *Flora der Vorwelt* of Sternberg had laid a solid foundation for such studies, and the *Végétaux Fossiles* of Adolphe Brongniart, then in progress of publication, was not only widening those foundations, but was systematising the study, as his "Prodrome" had developed the first principles of the philosophy of the primæval Flora. The late Professor Phillips had further recorded additional discoveries amongst the Oolitic plants of Yorkshire, in his "Geology of the Yorkshire Coast"; but there yet remained a wide field for exploration, especially amongst the plants of the Carboniferous age, in which England was especially rich; and Phillips and Brongniart were very far from having exhausted the newly-discovered plants of the Yorkshire Oolites. Hence when the two able authors above named commenced the publication of their "Fossil Flora," they found a vast mass of new materials awaiting their investigation. In endeavouring to estimate the true value of their work, we must not regard it from our present standpoint, but from that of the time at which they began their labours. At that period, though collections of fossil plants were numerous, they were scattered over the country in isolated cabinets, and no one knew much about what those cabinets contained. Hence the first work demanding attention was to ascertain what the forms and general relations of these fossil plants were, and the pages of the "Fossil Flora" gradually gave the needful information so far as it was then obtainable. The two authors named figured and described such distinct fragments as fell into their hands, and thus made available for the students of a later period a vast mass of hitherto unknown material. This important publication went on for several years—but at length the two authors became weary of their costly venture. The number of persons actively interested in the study of fossil plants was not sufficiently great to cover the expense of the publication, which consequently came to an abrupt end. In 1839 the late Dr. Lindley told the writer of these lines that he saw no reason why he should employ his purse for the benefit of the geologists who failed to give him the needful support, and he acted upon the conviction thus expressed.

In endeavouring to measure the true value of the work of Lindley and Hutton to modern science, we must not forget the date of their labours. At the earlier part of the time when the publication of the "Fossil Flora" was in progress, little or nothing was known of the internal organisation of any fossil plants. But at length two instructive fragments were obtained in England—one of a Lepidodendron, and the other of a Stigmaria—both of which examples revealed a measure of minute internal organisation. Witham's "Observations on Fossil Vegetables," published in 1831, contained figures and descriptions of the first of these specimens, the now well-known Lepidodendron Harcourtii, and the Stigmaria was figured and described in the "Fossil Flora." These two specimens were the beginnings of a rich harvest, which is even yet but very partially reaped, but which has already prepared the way for a revolution in the processes and results of Palæo-phytological studies. But though the authors of the "Fossil Flora" thus obtained some glimpses into the possible future of their science, they did little more. Like good and true men they did the best they could with the materials within their reach. They found various dissimilar fragments of apparently distinct forms of fossil plants which they named, figured, and described. They thus introduced a certain degree of order and definiteness into what had hitherto been a *rudis indigestaque moles.* This work benefited not only contemporary but succeeding races of geologists. Such labours as these are the necessary preliminaries to the more exact determinations of more advanced science. Work like this has to be done in the early stages of every branch of natural science, and no great harm arises from the multiplication of genera and species, if we only keep in mind the fact that such nomenclature is but provisional;—a mere ticketing of special forms for convenience of future reference. The names do not indicate very much more than the fancy designations given to various "makes" of cloth in a Manchester warehouse—*i.e.* convenient terms by which the business transactions of buyer and seller are facilitated. Mischief only arises from this essential method when we make these provisional nomenclatures the basis of ambitious philosophical speculations; when, for example, because a plant is designated by the name of Palmacites, we conclude that Palms flourished in the carboniferous age. Keeping in mind the true use of a provisional nomenclature we find it indispensable to further progress. When some inquirer, more advanced than his predecessors, demonstrates that *Sigillaria A* and *Sigillaria B* are merely the upper and lower parts of a common stem, it is useful to him to be able to indicate by his terms A and B what the types are that bear this mutual relationship.

The *scientific* worthlessness of very many of the generic and specific definitions and names of fossil plants is now becoming obvious to all advanced students of Fossil Botany. Yet the assignment of these names and definitions to such fragments as fell in their way is the chief result of the publication of the "Fossil Flora." To the philosophy of the study its authors added very ittle. They left the supposed relations of the great types of vegetation to each other pretty much where they found them. They seem to have accepted equally what was true and what was false in the philosophy of Adolphe Brongniart. No one important discovery will be handed down to the future associated with their names. Fragments from various parts of the same plant took rank at their hands as independent species. Little or no attempt was made for variations due to age and conditions of growth. Nor were they to be blamed for this. We are still to some extent in the same predicament—only, thanks to the warnings of Sir Joseph Hooker and others, we now know what we have to aim at. We have to try to accomplish for plants what Burmeister did for the Trilobites. But if the use of merely provisional names is to be continued, it is very desirable that we should possess some means of distinguishing between such a nomenclature, and one that represents philosophic truths and may be employed as the basis and instrument of philosophical speculations. Nothing of the kind has yet been attempted beyond the "incerta sedes" of Brongniart. Yet I think it would not be difficult to invent some technical sign that would answer this end. For the present it can only be left to the judgment of each individual observer to determine what names are of scientific value and what are not.

But the most essential truth which these later days are teaching us is the importance of the study of internal organisation; and especially of that of the reproductive structures, if fossil botany is to take its proper rank as a definite science. Nothing can be more dangerous than a reliance upon mere resemblances or differences of external form. We have a ready illustration of this in the numerous verticillate-leaved plants of the Carboniferous beds. So far as mere external forms are concerned, Calamites, Asterophyllites, Sphenophylla, and Annulariæ, with a host of less known modifications, bear a close resemblance to each other—and if a few Galiums, Asperulas, and other similar living exogenous forms could have been thrown in amongst them they would probably have been equally undistinguishable from the rest. The result is that the nomenclature and classification of these Carboniferous plants is in hopeless confusion. True, we are slowly emerging from this chaos, because we are learning to distinguish some of these forms from the rest through their widely differing features of internal organisation—and every fresh plant in which we do so diminishes the bulk of the chaotic mass that still needs reduction to order. Though so much has already been done in this way, we are yet only on the threshold of the study. At the same time we are moving in the right direction. Such localities as Autun, St. Etienne, Oldham, and Halifax have furnished, and are likely further to furnish, important materials—each locality having revealed characteristic forms of vegetation peculiar to it, mixed with other forms common to all the localities. It is to be hoped that other similar storehouses will be opened out, revealing fresh forms of structural organisation, since it is upon organisation alone that a sound classification of fossil plants can be based.

The recent republication of the "Fossil Flora" is almost an exact fac-simile of the original work—even to its title-page. Copies of the old edition being rarely obtainable this re-issue will be valuable to a large number of young geologists. At the same time it is desirable that something should be done to distinguish between statements still to be relied upon, and such as represent now exploded errors. This might have been done by the introduction of editorial notes—but instead of this, its accomplished editor, Mr. William Carruthers, is about to issue a supplementary volume, giving the existing state of our knowledge of many of the objects represented in the original work. This may well be expected to constitute a valuable addition to the volumes already issued.

The second publication named at the head of this notice has an affiliated relationship to the "Fossil Flora." When Hutton died he left behind him numerous drawings of fossil plants, obviously prepared for publication, many of them having connected with them manuscript annotations of various kinds. A selection from these has been published in an elegant volume issued under the auspices of the North of England Institute of Mining and Mechanical Engineers. It is obvious that many of these drawings represent plants of more doubtful nature than the majority of those published in the "Fossil Flora." It might be expected that the more definite types would be first selected for publication. But this is precisely what appears to me to constitute the value of the volume in question. We have but too frequently, though very naturally, figured and described the more definable types, the more obscure and intermediate forms being left for a further consideration, which sometimes never comes! Yet these obscure examples often teach most important truths. Had all writers paid due attention to such intermediate varieties, the science of Palæo-Phytology would have been less afflicted with premature "classifications" than has been the case. Hence the spirited society that has published these posthumous Huttonian memorials is entitled to the thanks of all Palæontologists.

W. C. WILLIAMSON

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## *TAXIDERMY*

*Practical Taxidermy; a Manual of Instruction to the Amateur in Collecting, Preserving, and Setting up Natural History Specimens of all Kinds.* By Montagu Browne. (London: *Bazaar* Office, 32, Wellington Street, Strand. No date.)

ACCORDING to the dictum uttered, or supposed to have been uttered, by one of our leading ornithologists, "The worst use you can make of a bird is to stuff it," and in nineteen cases out of twenty this saying is true, for, from a real naturalist's point of view, comparatively little can be got from the stuffed and mounted specimen not only of a bird but of almost any other animal. Nevertheless, there is a very large class of persons who are not real naturalists, and to them the skin of a beast, bird, reptile, or fish, duly prepared and embellished with glass eyes, stuck up with wire through its legs in a glazed box, and surrounded by imitation foliage, dried and dyed herbage, is a joy for ever, though perhaps not even to them a thing of beauty. For this large class the present book is intended, and it will probably attain its object, notwithstanding that how far the animal stuffer's trade is to be learned from any book without actual demonstration seems to be questionable. The author's practical knowledge of his business is, we doubt not, considerable, and it would have been better had he let alone some of the matters not really relating to it upon which he descants. His very first sentence tells us that taxidermy "is derived from two Greek words, a literal translation of which would signify the 'skin art'"—a statement which beats the time-honoured explanation of Hippopotamus, from *hippos*, a river, and *potamos*, a horse, inasmuch as *taxis* has as little to do with art as with the Queen's taxes—and then goes on to inform us, from Herodotus, the *Penny Cyclopædia*, and other trustworthy authorities, how the Egyptians made mummies, which is all as delightful as so ghastly a subject can be, but is certainly somewhat superfluous as "Instruction to the Amateur" in "preserving and setting up Natural History Specimens." Hardly less unnecessary is Chapter II. devoted to "Trapping and Decoying Birds and Animals," whereby we may remark that the author is of that persuasion which denies the animal nature of birds. But we may pardon him this and other offences for what he says (pp. 14, 15) against the needless destruction of the rarer "birds and animals," and thence to Chapter X. is much more to the purpose. We are sorry to see, however, that he is addicted to the usual taxidermist's mannerisms, most of which are fatal to good and artistic mounting. Paint, for instance, however thin, *on* bills and legs is an abomination. If colour is required it ought to be supplied by subcutaneous injection, which in the majority of cases can be easily and successfully done. Artificial twigs of wire and tow, dusted over with powdered lichens and the like, are nearly as objectionable as the external application of paint. As regards the stuffing of heads of large mammals the instructions given are really good, but we suspect that a satisfactory result cannot be obtained without far more experience and closer study of nature than the author would have us think necessary. We must reproach him, moreover, for not giving a hint to the learner as to the best mode of preparing the "skin" of a bird so as to prevent its head from breaking off. This is done by inserting a long lock of cotton-wool of tow into the cranium (from behind, of course) making it fast there by tight packing, and then twisting the remainder of the lock into a kind of loose cord, which does not distend the skin of the neck, enables its length to be adjusted as may be required, and finally affords a coherent and effectual support, whereas the ordinary mode of ramming bit after bit of stuffing into the neck has exactly the opposite tendency.

Mr. Montagu Browne speaks with complacency of the achievements of English "artists" in taxidermy; but it seems as if his acquaintance with foreign works was limited to the comical creatures from Würtemberg in the old Exhibition of 1851. We venture to say that there is hardly a museum on the Continent which has not its specimens mounted in a style that no professional in these islands can equal—certainly not surpass. When we look at that really awful group of the boa and the peccary, recently erected in the British Museum, we blush for the handiwork and ignorance it displays. The impression it gives is that the boa, being crammed into a cylindrical form, is quite inflexible, and that the peccary, though not a learned pig, is fully aware of the fact, so, feeling sure that there is no chance of his being crushed by his enemy, he rather likes the adventure than not.

The question of the use of arsenic in preparing skins we cannot discuss at any length. Our author declares that *Tineæ* and *Dermestæ* laugh it to scorn, even if they do not, as he believes, like the Styrians, "fatten on it" (p. 44). We shall only say that we prefer it, and know of a case in which a collector in the tropics, having exhausted his stock of the poison, was compelled to prepare some of his specimens without it, which specimens were some years afterwards attacked and greatly injured by insects; while others, obtained before his store gave out, and duly arsenicated, remained unharmed, though lying side by side in the cabinet with the specimens that suffered. Arsenical soap, it is true, does not keep either feathers or fur safe, simply because it cannot be applied to them, but it certainly preserves the skin according to our experience, and every travelling collector should unquestionably use it. Corrosive sublimate is effectual for a time, but the best preventive is a well-fitting cabinet—care being taken that infected specimens are never introduced to it. In conclusion let us caution our readers not to be misled by the similarity of the